

**MASTER OF BIO-MEDICAL ENGINEERING EXAMINATION, 2022**

(1st Year, 2nd Semester )

**MEDICAL IMAGING AND IMAGE PROCESSING**

Time : Three hours

Full Marks : 100

**User separate answer script for each part.**

**PART I (50 Marks)**

**( Image Processing )**

**Answer Question 1 and any other 2 questions : 10 + 2 X 20 = 50**

1. Answer any 5 : 5 X 2 = 10

- i. To convert a continuous sensed data into Digital form, which of the following is required?
  - a) Sampling
  - b) Quantization
  - c) Both Sampling and Quantization
  - d) Neither Sampling nor Quantization.
- ii. The quality of a digital image is well determined by \_\_\_\_\_
  - a) The number of samples
  - b) The discrete gray levels
  - c) All of the mentioned
  - d) None of the mentioned.
- iii. Digital images are displayed as a discrete set of
  - a) Values
  - b) numbers
  - c) frequencies
  - d) intensities.
- iv. Intensity levels of 8 bit image are
  - a) 255
  - b) 256
  - c) 244
  - d) 245.
- v. Luminance is measured in
  - a) Chromens
  - b) lumens
  - c) degree
  - d) steradian.
- vi. DPI stands for
  - a) Dots per image
  - b) dots per inches
  - c) dots per intensity
  - d) diameter per inches.
- vii. Smallest unit of an image is
  - a) pixel
  - b) dot
  - c) coordinate
  - d) digits.
- viii. Image subtraction is used for
  - a) color enhancement
  - b) frequency enhancement
  - c) spatial enhancement
  - d) detection.

2. Define digital image. Explain components of general purpose image processing system. Define brightness, hue, saturation and chromacity. 2+10+8=20

3. Write short notes on : (any 2) 2X10=20

- i. Sobel operator for edge detection

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- ii. Image sampling
  - iii. Image quantization
4. Write short notes on : (any 2)      2X10=20
- i. Low pass filters, High pass filters
  - ii. Discrete cosine transforms on image
  - iii. Walsh-Hadamard transform on images
5. What is Frequency domain? State properties of Fourier Transformation. Differentiate between blurring and sharpening. 3+7+10=20
6. What is edge detection? Explain global and adaptive thresholding techniques. Describe RGB color model with proper diagram. 5+10+5=20

**MASTER OF BIO-MEDICAL ENGINEERING FIRST YEAR SECOND SEMESTER – 2022  
MEDICAL IMAGING AND IMAGE PROCESSING**

Time: 3h

Full Marks: 100

**PART-II (50Marks)**

Use Separate Answer scripts for each PART

**Answer any five of the following questions****5x10=50**

1. a. Write the significance of light spectrum based on its utility in medical application with respect to different frequencies and wave length.  
  
b. Describe Beer-Lambert's law and write its importance for medical imaging techniques.  
  
c. Draw and discuss the three phase rectification and its utility in medical application.  
(2 +3+5)=10
2. Discuss about different generation of CT scanning and their advantages with appropriate schematic representation. 10
3. Explain Helical CT scan and Conventional CT scan. Difference between Helical CT scan and Spiral CT scan. 5 +5 =10
4. a. Advantages of rotating anode over stationary anode  
b. Inverse square law  
c. Multi-slice CT  
d. Fluoroscopy  
e. Piezoelectric effect 2.5 x 4 =10
5. a. What are the difference between photoelectric effect and Compton scattering?  
  
b. What are the role of collimator and grid? 5 + 5 =10
6. a. With diagram discuss the power system of the X-ray machine by considering the following technical views:
  1. Different Transformers
  2. Beam current
  3. Timer circuit
 b. What is ultrasonic Imaging Techniques? Write the different part of an Ultrasonic Imaging System. (4+2+1) + 3 =10
7. a. What type of transducer is used in for ultrasonic imaging? Write its basic principles as a medical imaging transducer.  
  
c. What are the A-mode, B-mode and M-mode of Ultrasonic Imaging Techniques? How this modes are associated with dimension of Image. (2+3) +5=10